

## NOTE ON THE RELATION OF THE OS MAGNUM TO TUBERCULOSIS OF THE WRIST-JOINT.

By DAVID EDWARD MUNDELL, M.D.,

OF KINGSTON, ONTARIO.

IN May, 1899, I was consulted by Mrs. W., aged thirty-six, who gave the following history: When nineteen years of age she began to suffer from pain in left wrist. In about a year and a half the wrist became swollen, and finally, after suffering more or less for five years, an abscess formed and "broke" in upper part of palm near wrist. The sinus continued to discharge for about two years, but during most of this period of seven years she could use the wrist to some extent. Inquiry elicited no family history of tuberculosis, and during the succeeding ten years her wrist did not trouble her, but about two years ago pain, gradually increasing in severity, returned. When seen by me the wrist was enlarged and fusiform, and any movement of the joint was painful. Pressure over carpus elicited a very sensitive spot on a line between the bases of index and middle fingers. X-ray examination presented the appearance as seen in the accompanying skiagraph, the radius and ulna not being involved, though the carpal bones are. Rarefaction is most pronounced in the os magnum. Iodoformized glycerin and Bier's method were tried, but the pain continuing excruciating, excision was advised, and, being accepted, Ollier's method was followed. Instead of removing the carpus *en masse*, the neck of the os magnum was divided so as to permit freer access to semilunar and scaphoid, which, with the other bones, were easily removed with the assistance of a dental root elevator. In a letter received a short time ago from her, she stated that she has been free from pain since the operation; there is no ulnar flexion, and she can perform her household duties as well as ever.

In June, 1897, I saw Mrs. M., tubercular parentage, who gave a history of swelling of wrist of two years' duration accompanied

by gradually increasing pain. The skiagraph showed rarefaction of the carpal bones, most marked, however, in the os magnum. The usual treatment had no effect, but she would not submit to operative interference. She died about a year afterwards from acute pulmonary tuberculosis.

A third case, a Mrs. R., stated that her mother, two sisters, two aunts, and two uncles had died from consumption. From the age of three until eleven she suffered from cervical adenitis, necessitating the removal of the glands. About six years ago she sprained her wrist, and since then swelling accompanied by severe burning pain has been constant. For the last two years a splint had been worn, but during this period she had very little rest night or day except from the use of morphine. The X-rays showed tubercular disease of the carpus, involving the os magnum to a greater degree than the other bones. A partial excision was done through a single posterior incision, removing the bones as described above, but leaving the pisiform and trapezium.

The results in this case are equally as good as in Case 1. On examination of the skiagraphs of the cases above reported, the involvement of the os magnum, showing that the disease had started in this bone, or, if not, had made most progress in it, arrested my attention; and on looking through the collection of the superintendent of the General Hospital the prominence of this bone as a factor in the development of tuberculosis of wrist-joint was emphasized, for in the three cases in his collection the os magnum showed most disease. Tubercle bacilli manifest themselves in bone by a process of rarefaction; hence that bone, most rarefied, would in all probability be the one in which the processes are most active. It is hardly likely that the disease would start in all simultaneously and develop to such a degree that the os magnum, as shown by the skiagraph, would be almost entirely destroyed, and some of the others hardly involved; hence, the inference is that in the os magnum the tubercular process first began. Ollier emphasizes the importance of juxta-epiphyseal strain in the production of tuberculosis of long bones. And on the same principle, repeated strains on any bone may favor tuberculosis on account of minute foci of inflammation resulting from the "jarring"

of the trabeculae. As an explanation of why this would likely affect the os magnum, the following considerations seem pertinent. The os magnum is a pivot, being the central and main bone of the carpus, and articulates with seven other bones, the trapezoid coming next with five articulations, and, being superimposed on the middle or chief metacarpal, it would receive the effects of traumatism to which the latter is subjected, as well as those of the index- and ring-fingers with which also it articulates. Again, the midcarpal joint, composed principally of the os magnum and tip of the trapezoid which form an enarthrodial joint with the semilunar and scaphoid, participates in every movement of flexion and extension of the wrist. And as two strong bands—oblique fibres of anterior annular ligament from both radius and ulna and the radial fibres of posterior ligament, as well as accessory bands from semilunar, scaphoid, and trapezoid—are attached to this bone, it follows that, in the frequent movements of the midcarpal joint, the tension of these ligaments causes strain on the os magnum. Following out her general rule of strengthening weak parts, or of assisting them to resist traumatism, Nature has caused the centre of ossification to appear earlier in this than in the other carpal bones,—a few months before the trapezoid, which is also subjected to strain, though in lesser degree and years before those of the other bone. Further, she hastens the ossifying process in the os magnum, since, in a child of two and a half years of age, I found that, though the centres for the os magnum and trapezoid had started within a few months of each other, that for the os magnum measured six millimetres, while in the trapezoid it was only three millimetres in diameter.

Again, as the posterior border of the overhanging receiving cavity for the os magnum is more prominent than the anterior border, a greater amount of flexion than extension is permitted at the midcarpal joint; hence the posterior surface of os magnum would be subjected to greater strain than the anterior, from the tension of the ligaments resisting flexion; and I found the ossifying process developed more towards the posterior aspect of the bone than the anterior, so that there was

only a thin shale of bone between the centre and the posterior surface, whereas, in front, there is an appreciable wall of two millimetres. At ten years of age I found that while the other bones exhibit a varying degree of ossification the os magnum is almost completely ossified. These facts would seem to indicate provision against, and therefore acknowledgment of, the greater amount of strain on the os magnum. On making a coronal section of a fresh adult bone, there appears a slight condensation of osseous tissue on the radial side of section, and on a forced injection of an arm with carmine gelatin the main vascular supply was on the posterior aspect of the bone, and the cancellous inner portion was more richly supplied with blood than the slightly more compact outer part. Summing up, then, the above considerations, we find that the os magnum, the main bone in the wrist, is the earliest to ossify; that it is so situated as to receive the effects of injuries from three metacarpal bones; that it performs more movement in flexion and extension than the other bones; that in these movements greater strain is thrown on it than on the other carpal bones, from the numerous ligaments connected with it and resisting such movements; that the cancellated structure of the os magnum is uneven; that that portion, the inner, which has the wider spaces, and is therefore less strong, has a richer blood-supply. For the above reasons, it seems to me that vibrations the result of traumatism would affect the os magnum more often than the other carpal bones, and especially that portion of it referred to above which consists of less numerous trabeculae. Therefore it would seem reasonable that tubercle bacilli in the blood or lymph would be more prone to concentrate here than in any of the other carpal bones, and would in all probability involve the inner portion of the bone.

Lastly, the pain has been described by patients as of a burning, aching character, and, in my opinion, is the result, in the early stage of the disease at least, of pressure on the synovial membrane between the os magnum and trapezium, because these two are more closely bound together than any of the other bones; hence the enlargement of the os magnum

from the tubercular process—though this enlargement would be very slight, for tuberculosis of bone is accompanied by very little increase in size—will be sufficient to “nip” the synovial membrane between it and the trapezium. The point of greatest tenderness in the above cases was on a line between index- and middle-finger, corresponding, therefore, to this situation. Again, Barwell, in “*International Encyclopædia of Surgery*,” states that in tuberculosis of wrist-joint the point of special tenderness is on the outer side of the extensor indicis tendon, a situation corresponding to the junction of os magnum and trapezium.





FIG. 1.—*A*, External shell of bone (major tuberosity held outward by chisel);  
*B*, internal shell of bone retracted inward; *C*, bicipital groove.